CLAIMS

What is claimed is:

1. An optically active linear single polarization device, comprising:

a linearly birefringent and linearly dichroic optical waveguide for propagating light and having a single polarization wavelength range; and

a plurality of active dopants disposed in a portion of the linearly birefringent and linearly dichroic optical waveguide for providing operation of the waveguide in an operating wavelength range for overlapping the single polarization wavelength range.

2. The single polarization device of claim 1 wherein the waveguide comprises a polarization maintaining (PM) fiber having optical fiber polarization components along a first linear polarization characteristic mode and along a second linear polarization characteristic mode with a sufficient differential polarization dependent loss (PDL) between the first and second modes accumulated over a sufficiently long waveguide length such that the first polarization mode has a first attenuation of 3dB at a first cut-off wavelength and the second polarization has a second attenuation of 3dB at a second cut-off wavelength to provide the single polarization wavelength range having a single polarization center wavelength between the first and second cut-off wavelengths and the first cut-off wavelength is less than the second cut-off wavelength, wherein the single polarization center wavelength is sufficiently close to the center operating wavelength.

3. The single polarization device of claim 1 further comprising a pump signal coupled to the waveguide for exciting the plurality of active dopants, the plurality of active dopants for providing a gain medium for the waveguide for emitting an output light in the operating wavelength range.

4. The single polarization device of claim 3 wherein the output light emitted from the gain medium is broadband light selectively filtered by a predetermined narrowband wavelength range of a wavelength selective filter for providing feedback over the predetermined narrowband wavelength range, wherein the predetermined narrowband wavelength range is included within the single polarization wavelength range.

5. The single polarization device of claim 2 wherein the optical fiber comprises:

an optically active doped central core having a maximum dimension (A) greater than a minimum dimension (B) and a substantially elliptical shape, the fiber having at least one air hole positioned each opposite side of the central core wherein the optical fiber supports a single polarization mode within the operating wavelength range.

6. The single polarization device of claim 5 wherein the sufficiently long waveguide length is in a range about 5 centimeters to 1 meter and the sufficient differential polarization dependent loss (PDL) is greater than 3dB across the single polarization wavelength range.

7. The single polarization device of claim 1 wherein the linearly birefringent and linearly dichroic optical waveguide comprises a highly birefringent fiber having birefringence greater than 10^{-6}.

8. The single polarization device of claim 1 wherein the linearly birefringent and linearly dichroic optical waveguide comprises a gain doped elliptical core fiber spliced to an undoped single polarization fiber.

9. The single polarization device of claim 4 wherein the wavelength selective filter comprises a fiber Bragg grating.

10. A system including the single polarization device of claim 1 wherein providing operation of the waveguide comprises providing gain.

11. The system of claim 10, wherein the optical component comprises a laser diode for optically coupling to the single polarization device to form a pump source.

12. The system of claim 11, wherein the optical component comprises an Erbium Doped Fiber for optically coupling to the pump source to form an Erbium Doped Fiber Amplifier (EDFA).

13. The system of claim 10, wherein the optical component comprises a laser diode for optically coupling to the single polarization device to form an amplifier.

14. The single polarization device of claim 1 wherein the linearly birefringent and linearly dichroic optical waveguide comprises a single-clad fiber having a core for dispersal of the plurality of active dopants and an asymmetric depressed cladding surrounding the core.

15. The single polarization device of claim 1 wherein the linearly birefringent and linearly dichroic optical waveguide comprises a double-clad fiber having a elliptical core for dispersal of the plurality of active dopants, a pair of apertures disposed about the core, an inner cladding surrounding the core, and an outer cladding surrounding the inner cladding.

16. The single polarization device of claim 15 wherein the single polarization device comprises a double-clad fiber laser.

17. The single polarization device of claim 15 wherein the single polarization device comprises a double-clad fiber amplifier.

18. A linear single-polarization double-clad fiber laser, comprising:

a pump source for providing a pump light;

a double-clad linearly birefringent and linearly dichroic fiber for propagating light and having a single polarization wavelength range, the fiber having a first end for receiving the pump light and a second end for outputting a laser signal, the fiber including

a core for supporting close to a single-mode transmission of the laser signal, the core doped with a plurality of optically excitable dopants having a transition requiring an inversion at a desired signal wavelength of the laser signal;

a grating disposed on the fiber for providing feedback over a predetermined narrowband wavelength range within the single polarization wavelength range wherein the fiber supports only a single polarization mode;

an inner cladding disposed adjacent to the core for receiving the pump light; and

an outer cladding disposed adjacent to the inner cladding having an index of refraction less than the inner cladding for confining the pump light.

19. The linear single-polarization double-clad fiber laser of claim 18 wherein the core has an elliptical shape to provide a large modal area having a core index delta to provide a numerical aperture of about 0.06 to 0.08.

20. A method for generating a linear single-polarization output beam, the method comprising the steps of:

providing an optically active linearly birefringent and linearly dichroic fiber for propagating light and having a single polarization wavelength range and a gain bandwidth;

optically pumping the optically active linearly birefringent and linearly dichroic fiber for obtaining fluorescence within the gain bandwidth; and

aligning the single-polarization wavelength range to overlap a desired spectral region of the gain profile.